ABSTRACT OF THE DISCLOSURE

An electrochemical device having an electrolyte having an anode side and a cathode side, at least one consumable carbonaceous material disposed on the anode side, and a chemical barrier disposed on the anode side of the electrolyte, which chemical barrier reduces crossover of the at least one consumable carbonaceous material through the electrolyte to the cathode side. In accordance with one preferred embodiment, the electrochemical device is a direct methanol fuel cell, the consumable carbonaceous material is methanol disposed in an aqueous solution, and the chemical barrier is produced by the presence of an additive disposed in the methanol solution which attaches to potential methanol crossover sites in the electrolyte, thereby precluding methanol crossover using such sites. One such suitable additive is iso-propanol.